REMARKS

Claims 1-28 are in the application.

Claims 1, 4-7, 11-15, 19, and 22-25 are objected to because of the recitation of "plate-like" and "box-like". The phrase "plate-like" has been amended to --plate-shaped--. The phrase "a substantially box-like shape" has been amended to --a shape substantially corresponding to a box--. No intended change in scope is made.

Claims 4 and 22 are rejected under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claims 4 and 22, the phrase "similar material" has been cancelled.

Claims 1-2, and 4-6 and 11-14 are rejected under 35 U.S.C. § 102(a)[(b)?] as being anticipated by Loeppert et al. (US 6,535,460).

The examiner interprets Loeppert '460 as teaching an acoustic diaphragm (12) that comprises a rigid plate-shaped member (40, 41, 42, 43) supported upon and is pivotal about a side thereof (figures 5, 6), wherein the rigid plate-shaped member (40,41,42,43) has torsional and translational stiffeners (also see col. 5, lines 20-23 and col. 6, lines 3-10).

Claim 1 has been amended to recite:

An acoustic diaphragm having a dynamic response extending throughout the audible range, comprising a rigid plate-shaped member supported upon a stiffened edge of a side thereof which pivots on torsional springs, said rigid plate-shaped member having torsional and translational stiffeners.

Claim 11 has been amended to recite:

An acoustic diaphragm having a robust dynamic response extending throughout an audible range, comprising a rigid plate-shaped member supported upon a "T"-shaped cross section disposed on a side thereof which is pivotally suspended by torsional springs, said rigid plate-shaped member having torsional and translational crossbar stiffeners

Loeppert '460 fails to teach or suggest at least a stiffened edge or "T"-shaped cross section of a side of a rigid plate shaped member, which itself pivots on torsional springs. The structure according to the present claims provides a dynamic response within the audible range which is controlled by the torsional springs (and air equalization

pathways bypassing the diaphragm), since the diaphragm itself is rigid with respect to the acoustic environment. Because the edge is supported on torsional springs (see specification, page 5, line 1), the diaphragm is largely decoupled from stresses that might cause warpage or buckling on one hand (page 1, line 17) or tension on the other (page 2, line 1). Likewise, the presently claimed configuration, with a stiff edge, effectively provides a cantilever-type response from a torsionally mounted diaphragm while avoiding providing a support extending a side of the plate. Loeppert '460 discloses a circular diaphragm which is mounted about its periphery, and therefore is not pivotally mounted. Therefore, claim 1 is believed distinguished from Loeppert '460.

Claim 2 provides "The acoustic diaphragm in accordance with claim 1, wherein said torsional and translational stiffeners comprise cross members traversing said rigid plate-shaped structure." It is respectfully submitted that Loeppert '460 does not teach or suggest such structures.

Claims 19-20 and 22-24 are rejected under 35 U.S.C. § 102(b) as being anticipated by Loeppert et al. (US 5,870,482).

Regarding claim 19, Loeppert '482 allegedly teaches an acoustic diaphragm (12) having a dynamic response extending through the audible range, and the acoustic diaphragm (12) comprising a rigid plate-shaped member cantilevered about one side thereof (figures 1, 1a). The rigid plate shaped member allegedly has torsonial and translational stiffeners (figure la, 6a, 6b, 7a, col. 4, 49-63 and col. 5, lines 1-31).

Claim 19 is amended to provide:

An acoustic diaphragm having a dynamic response extending throughout the audible range, comprising a plate-shaped member cantilevered about one side thereof from a stiff edge, said stiff edge being pivotally supported by torsional springs, said plate-shaped member having torsional and translational stiffeners to provide a robust dynamic response to acoustic waves by displacement about said torsional springs extending throughout the audible range, having a dynamic response dominated by a single mode of vibration outside of the audible range.

Loeppert '482 fails to teach or suggest at least a stiffened edge or "T"-shaped cross section of a side of a rigid plate shaped member, which itself pivots on torsional springs. The structure according to the present claims provides a dynamic response

throughout the audible range which is controlled by the torsional springs (and air equalization pathways bypassing the diaphragm), since the diaphragm itself is rigid with respect to the acoustic environment. Because the stiff edge is supported on torsional springs (see specification, page 5, line 1), the diaphragm is largely decoupled from stresses that might cause warpage or buckling on one hand (page 1, line 17) or tension on the other (page 2, line 1). Likewise, the presently claimed configuration effectively provides a cantilever response from a torsionally mounted diaphragm. Loeppert '482 discloses a cantilever mounted diaphragm (as admitted by the examiner) which is not pivotally mounted. Therefore, claim 19 is believed distinguished from Loeppert '482.

With respect to claim 20, Loeppert '482 does not teach or suggest that the torsional and translational stiffeners comprise continuous cross members.

Claim 21 provides that "the stiff edge comprises a "T"-shaped cross section whose length and cross-section are adapted to tune said acoustic diaphragm so that its lowest resonant frequency is higher than the audible range." Loeppert '482 discloses no corresponding "T"-shaped cross section which is pivotally mounted, let alone one adapted for the stated purpose.

Claims 3, 7-10 and 15-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Loeppert et al. (US 6,535,460).

The examiner states that Loeppert '460 shows the side that supports the diaphragm comprising a "T"-shaped cross section (figure 6). Applicant respectfully submits that Loeppert '460 fails to show such a cross section in Fig. 6 or elsewhere, and therefore the remainder of the analysis is deficient for at least that reason.

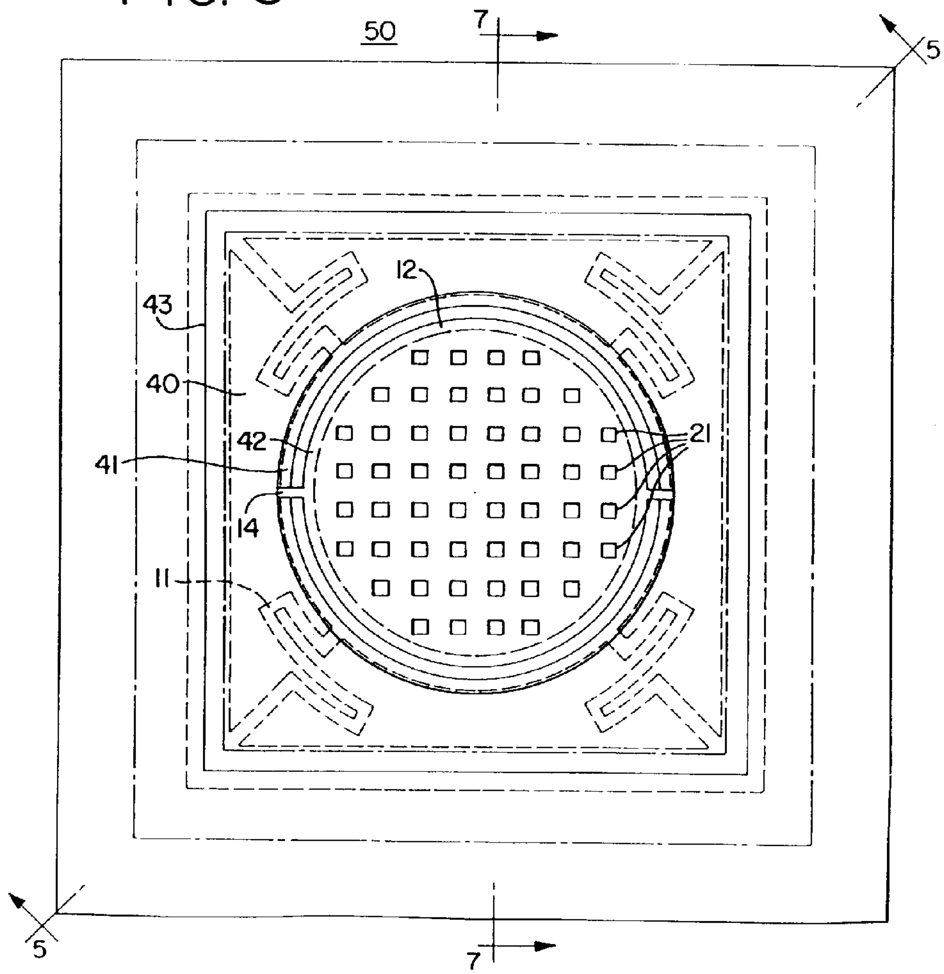
The portion of Loeppert '460 which describes Fig. 6 and the mounting of the diaphragm is as follows. Note that the perforated member is different than the diaphragm:

> Turning to FIGS. 5-7, an alternative embodiment of an acoustic transducer in accordance with the present invention is depicted. The transducer 50 includes a conductive diaphragm 12 and a perforated member 40 supported by a substrate 30 and separated by an air gap 20. The diaphragm 12 is attached to the substrate through a number of springs 11, which serve to mechanically decouple the diaphragm from the substrate, thereby relieving any intrinsic stress in the diaphragm. Moreover, the diaphragm is released for stress in the substrate and device package.
>
> The lateral motion of the diaphragm 12 is restricted by a support structure 41 in the perforated member 40, which also serves to maintain the proper initial spacing between diaphragm and perforated member 40. The support structure 41 may either be a continuous ring or a plurality of bumps. If the support structure 41 is a continuous ring, then diaphragm 12 resting on the support

structure 41 forms tight acoustical seal, leading to a well controlled low frequency roll-off of the transducer. If the support structure 41 is a plurality of bumps, then the acoustical seal can be formed by limiting the spacing between the bumps, or by providing a sufficiently long path around the diaphragm and through the perforations 21.

The conducting diaphragm 12 is electrically insulated from the substrate 30 by a dielectric layer 31. A conducting electrode 42 is attached to the non-conductive perforated member 40. The perforated member contains a number of openings 21 through which a sacrificial layer (not shown) between the diaphragm 12 and the perforated member is etched during fabrication to form the air gap 20 and which later serves to reduce the acoustic damping of the air in the air gap to provide sufficient bandwidth of the transducer. A number of openings are made in the support structure 41 to form a leakage path 14 (FIG. 6) which together with the compliance of the back chamber (not shown) on which the transducer can be mounted forms a high-pass filter resulting in a roll-off frequency low enough not to impede the acoustic function of the transducer and high enough to remove the influence of barometric pressure variations. The openings 14 are preferably defined by photo lithographic methods and can therefore be tightly controlled, leading to a well defined low frequency behavior of the transducer. The attachment of the perforated member along the perimeter 43 can be varied to reduce the curvature of the perforated member due to intrinsic internal bending moments. The perimeter 43 can be smooth (FIGS. 5-7) or corrugated (FIGS. 8 and 11). A corrugated perimeter provides additional rigidity of the perforated member thereby reducing the curvature due to intrinsic bending moments in the perforated member.

FIG. 6



It is noted that the examiner's dimensional analysis of Loeppert '460 is unsupported by the disclosure thereof, and the examiner has not presented a prima facie case of obviousness for claims 7-10 and 15-18. In any case, even were the examiner to show that the particular numeric specifications are supported by the reference, the configuration is sufficiently different so as to be nonetheless non-obvious. Note that, since the various parameters are interactive, the mere targeting of a resonant frequency (itself not taught by Loeppert '460) does not itself define the thickness of the diaphragm, or the dimensions of the stiffeners.

Note also that the usable range of the transducer according to the present claims is preferably below the first dominant resonance, and therefore the minimum resonant frequency is above the usable acoustic range. Therefore, the examiner's arguments on

page 7, second and third paragraphs of the office action, not relevant to a consideration of the obviousness of the claims.

Claims 21 and 25-28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Loeppert et al. (US 5,870,482).

The examiner admits that per claim 21, Loeppert '482 shows the side that is cantilevered comprising a "T" section as claimed (figures 1, la). However, the present claims specifies that the diaphragm pivots, and therefore the claims distinguish a cantilever mounted diaphragm as shown in Loeppert '482. Applicant disagrees that Loeppert '482 discloses a "T"-shaped cross section which is pivotally mounted, and in any case, a modification of the corresponding structures (if any) of Loeppert '482 to control the resonant frequency would be based on a different rationale and set of governing principles.

It is further noted that the stiffness of the diaphragm support is but one of the parameters that is relevant in determining the resonant frequency. The "T" shaped cross section of the present claims can be controlled independently in width, length, height, vertical thickness, and horizontal thickness. The stiffness of the support of Loeppert '482, on the other hand, can only be controlled in width and length. These limited available modifications of Loeppert '482 make it more difficult to obtain the desired high natural frequencies, and require more compromise. Therefore, the specification of a "T"-shaped cross section which is pivotally mounted is both advantageous, and non-obvious.

The examiner admits that Loeppert '482 does not specifically disclose the thickness of the rigid member and the dimensions of the torsional and translational stiffeners as claimed in claims 25-26, nor the resonant frequencies of claims 27-28. In order to formulate a prima facie case of obviousness, the examiner must show that the specific claim parameters are obvious. In this case, the examiner posits that any microphone size or resonant frequency is possible, and therefore that the entire range is obvious. This, however, neglects a consideration of enablement for the specific sizes or frequencies claimed, and the explanation of the motivation for such sizes, as required by the Supreme Court in KSR.

It is therefore respectfully submitted that the claims are now allowable. The examiner is respectfully invited to call the undersigned if any issues remain outstanding.

Respectfully submitted,

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